I-405 Bellevue Nickel Improvement Project
I-90 to Southeast 8th Street

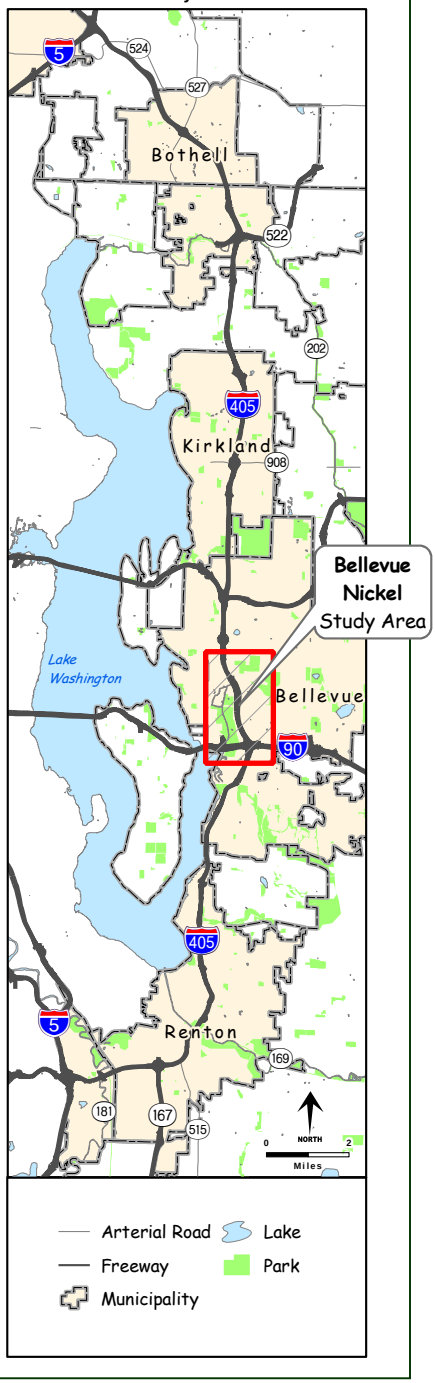
INTERSTATE 405 Corridor Program

Congestion Relief & Bus Rapid Transit Projects

ENERGY
DISCIPLINE REPORT

January 2006

I-405 Project Area



Washington State Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

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Glossary

best management practices (BMPs)	BMPs are generally accepted techniques that, when used alone or in combination, prevent or reduce the adverse effects of a project.
British thermal unit (BTU)	A unit of energy. The amount of energy required to heat 1 pound of water by 1 degree Fahrenheit.
Nickel Package	A statewide transportation-funding plan that the Washington State legislature approved in 2003.
WSDOT Standard Specifications	Guidelines and procedures established by WSDOT for roadway design and construction in a variety of design, engineering, and environmental manuals.

Acronyms and Abbreviations

ADT	average daily traffic volume
BMPs	best management practices
BNSF	Burlington Northern Santa Fe Railroad
BTU	British thermal unit
Caltrans	California Department of Transportation
CEVP	cost estimating validation process
EA	environmental assessment
EIS	environmental impact statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
I-405	Interstate 405
I-90	Interstate 90
MBTU	million British thermal units
mpg	miles per gallon
mph	miles per hour
NB	northbound
NEPA	National Environmental Policy Act
ROD	record of decision
SB	southbound
Sound Transit	Central Puget Sound Regional Transit Authority
VMT	vehicle miles traveled
WSDOT	Washington State Department of Transportation

Introduction

In 1998, the Washington State Department of Transportation (WSDOT) joined with the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), Central Puget Sound Regional Transit Authority (Sound Transit), King County, and local governments in an effort to reduce traffic congestion and improve mobility in the Interstate 405 (I-405) corridor. In fall 2002, the combined efforts of these entities culminated in the *I-405 Corridor Program Final Environmental Impact Statement (EIS)* and *FHWA Record of Decision (ROD*).

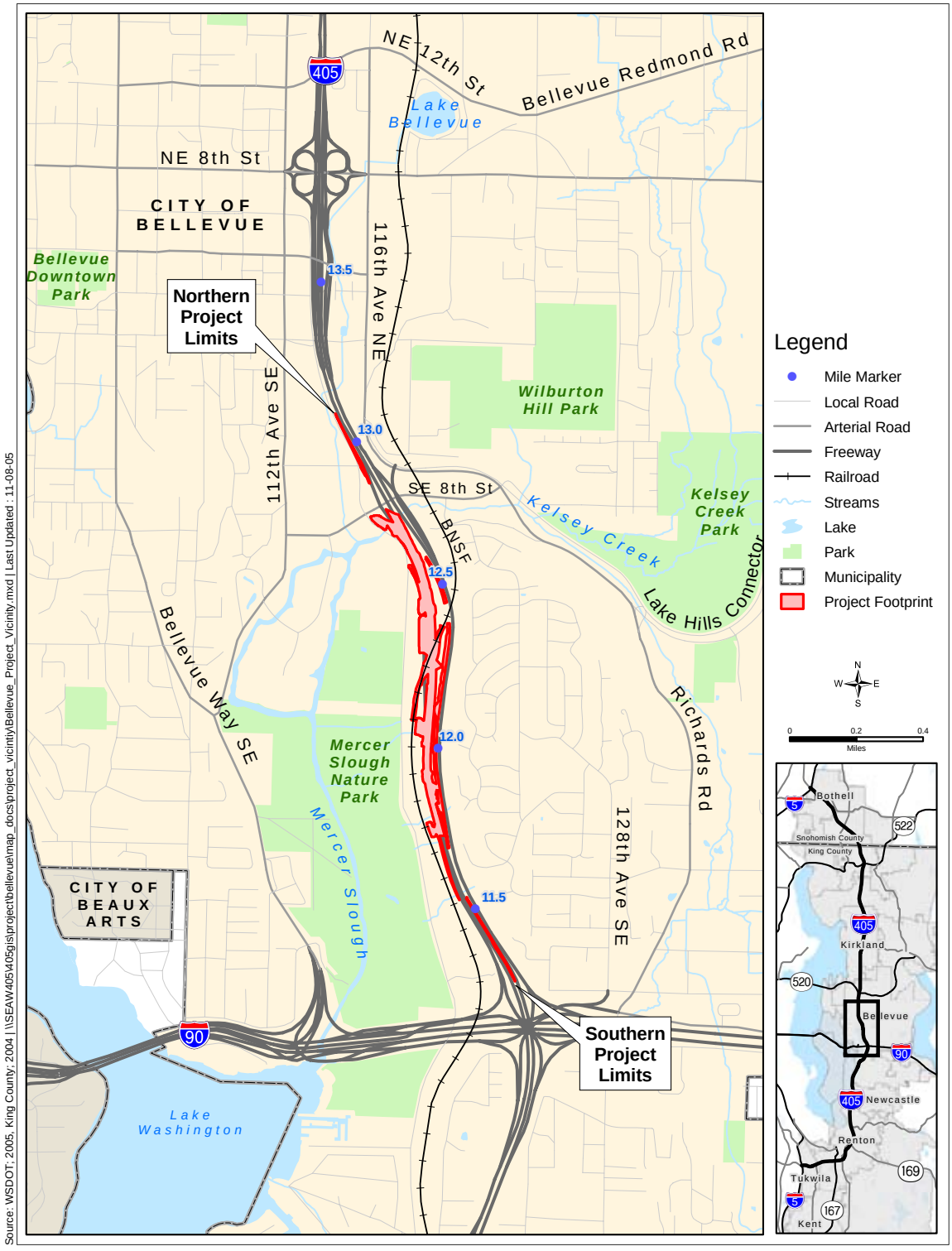
The ROD selected a project alternative that would widen I-405 by as many as two lanes in each direction throughout its 30-mile length. The ultimate configuration of the selected alternative includes buffers separating general-purpose lanes from parallel high-occupancy vehicle (HOV) lanes (potentially used by future high-capacity transit). The design also allows for expanded "managed lane" operations along I-405 that could include use of HOV lanes by other user groups, such as trucks.

In 2003, the Washington State legislature approved a statewide transportation-funding plan called the "nickel package." The nickel package provided funding for congestion relief projects in three critical traffic hotspots along the I-405 Corridor: Renton, Bellevue, and Kirkland. The Bellevue Nickel Improvement Project is one of several projects now moving forward as part of a phased implementation of the I-405 Corridor Program. Exhibit 1 shows the location of the Bellevue Nickel Improvement Project.

In 2003, the Washington State legislature approved a statewide transportation-funding plan called the "nickel package." The nickel package provides funding for congestion relief projects in three critical traffic hotspots along the I-405 Corridor, including Bellevue.

Traffic moving along I-405

Exhibit 1. Project Vicinity Map



In keeping with the direction established in the Final EIS (FEIS) and ROD, we are preparing a National Environmental Policy Act (NEPA) Environmental Assessment (EA) that focuses on project-level effects of constructing and operating the Bellevue Nickel Improvement Project.

The Environmental Assessment will describe new project changes, information, effects, or mitigation measures, but the assessment will not revisit the alternatives, impacts, and mitigation measures evaluated in the corridor-level EIS or the decisions documented in the *Record of Decision.*

We will base the EA on the analysis in the *I-405 Corridor Program Final EIS,* and will describe any new or additional project changes, information, effects, or mitigation measures not identified and analyzed in the corridor-level FEIS. The project-level EA for the Bellevue Nickel Improvement Project will not reexamine the corridor-level alternatives, impacts, and mitigation measures presented in the corridor-level FEIS, or the decisions described in the ROD.

What alternatives do we analyze in this discipline report?

This discipline report is one of 19 environmental elements WSDOT will study to analyze the effects of the Bellevue Nickel Improvement Project. All of the discipline reports will analyze one build alternative and one "no build" or "no action" alternative. This approach is consistent with FHWA's guidelines for preparing a NEPA EA.

What is the No Build Alternative?

NEPA requires us to include and evaluate the No Build Alternative in this discipline report. We use this approach to establish an existing and future baseline for comparing the effects associated with the Build Alternative. We assume the No Build Alternative will maintain the status quo: only routine activities such as road maintenance, repair, and safety improvements would occur within the corridor between now and 2030. The No Build Alternative does not include improvements that would increase roadway capacity or reduce congestion on I-405. We describe these improvements further in the Bellevue Nickel Improvement Project Traffic and Transportation Discipline Report.

We assume the No Build Alternative will maintain the status quo: only routine activities such as road maintenance, repair, and safety improvements would occur within the corridor between now and 2030.

What are the principal features of the Build Alternative?

The Bellevue Nickel Improvement Project will add one new general-purpose lane in each direction along a 2-mile section of I–405 between I-90 and SE 8th Street. We will generally use the

inside or "median" side of I-405 for construction. After we re-stripe the highway, the new lanes will occupy the outside of the existing roadway. The project also includes new stormwater management facilities and better drainage structures and systems.

Other project activities include developing off-site wetland mitigation as well as on-site stream mitigation areas to compensate for the loss of these resources within the project area. We expect project construction to begin in spring 2007 and the improved roadway to be open to traffic by fall 2009.

Improvements to Southbound I-405

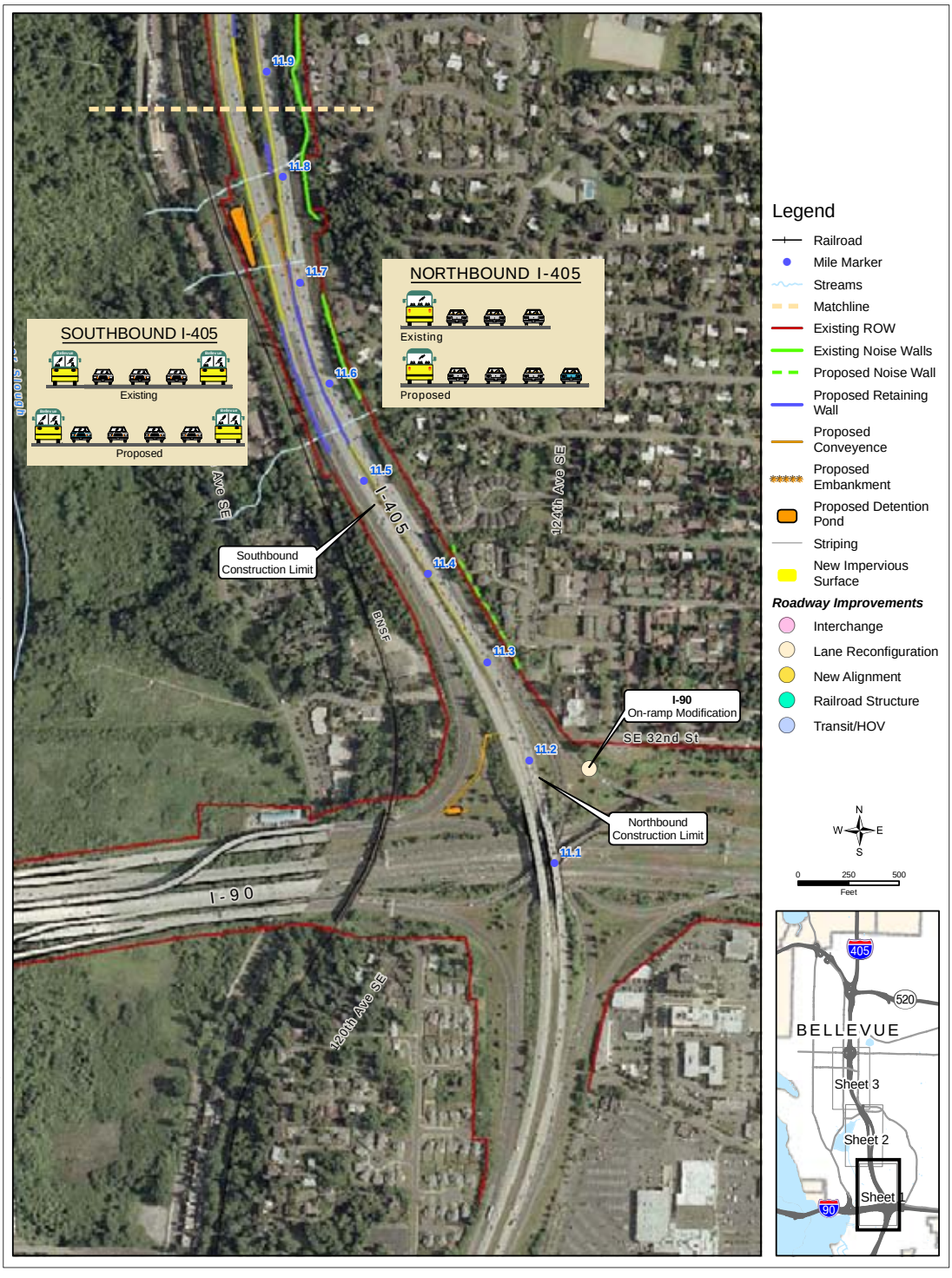
We will add one lane in the southbound direction of I-405 from approximately SE 8th Street to I-90.

In the southbound (SB) direction, we plan to add one new travel lane from approximately Southeast (SE) 8th Street to I-90 (Exhibits 2, 3, and 4). In addition, the existing outside HOV lane at I-90 will be extended north so that it begins at the on-ramp from SE 8th Street. In order to add these lanes and maintain traffic flow during construction, we will shift approximately 3,000 feet of the SB roadway as much as 200 feet east into the existing median. The relocated SB roadway will connect to the existing SB travel lanes just north of the I-90 interchange, and south of the existing bridge over SE 8th Street.

We will build a new tunnel underneath the Burlington Northern Santa Fe (BNSF) railroad, just east of the existing Wilburton Tunnel, to accommodate the relocated and widened SB roadway. The existing tunnel does not have the capacity to accommodate additional lanes of SB traffic.

The existing SB travel lanes and the Wilburton Tunnel will remain open to traffic during construction of the new tunnel and the relocated/widened SB lanes. We will also build the new tunnel wide enough to accommodate additional lanes. The existing tunnel will remain after we complete the improvements.

Exhibit 2. Proposed Bellevue Nickel Project Improvements (Sheet 1 of 3)



Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405gis\project\bellevue\map_docs\discipline_reports\project_description\Project Description.mxd | Last Updated : 11-07-05 |

Exhibit 3. Proposed Bellevue Nickel Project Improvements (Sheet 2 of 3)

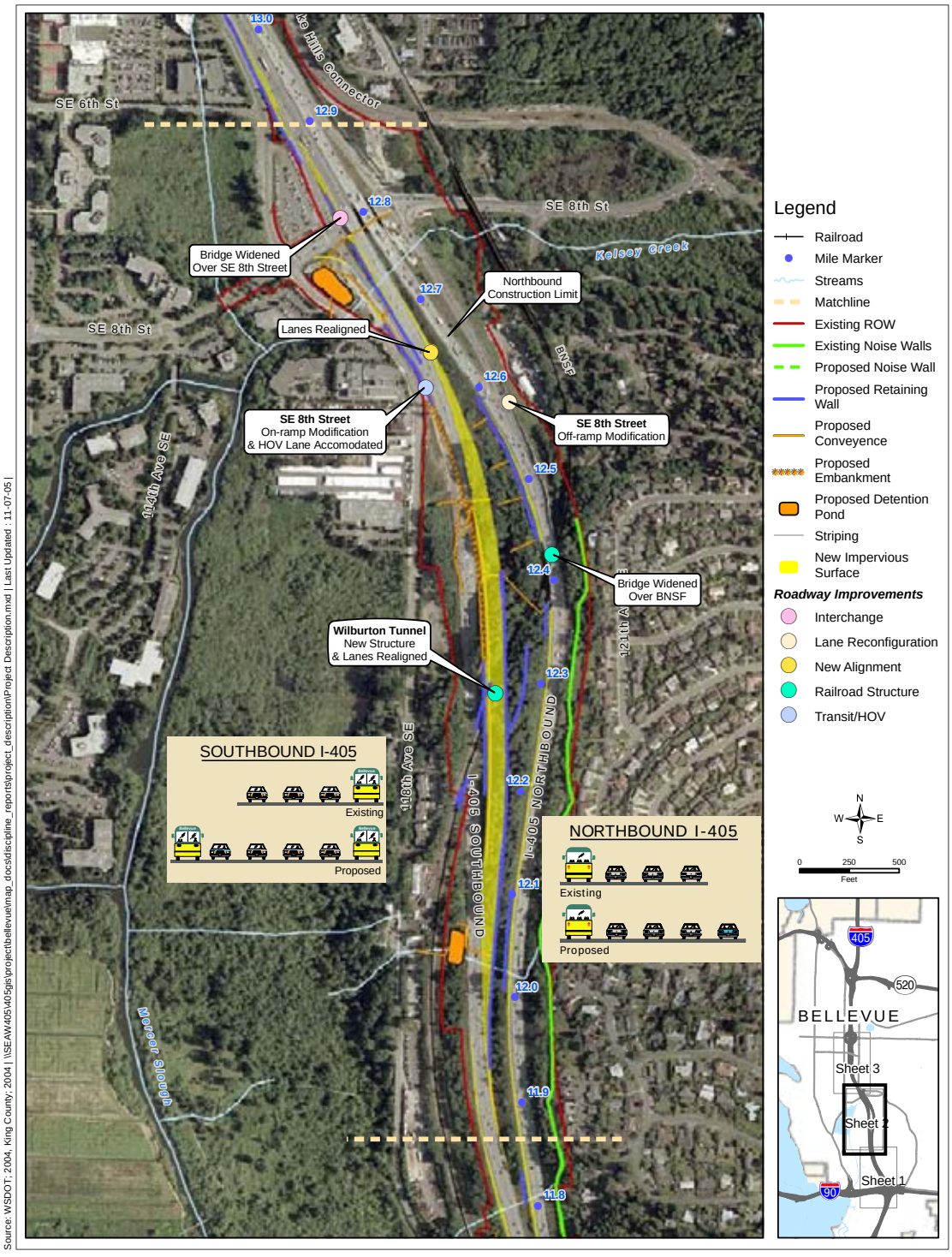


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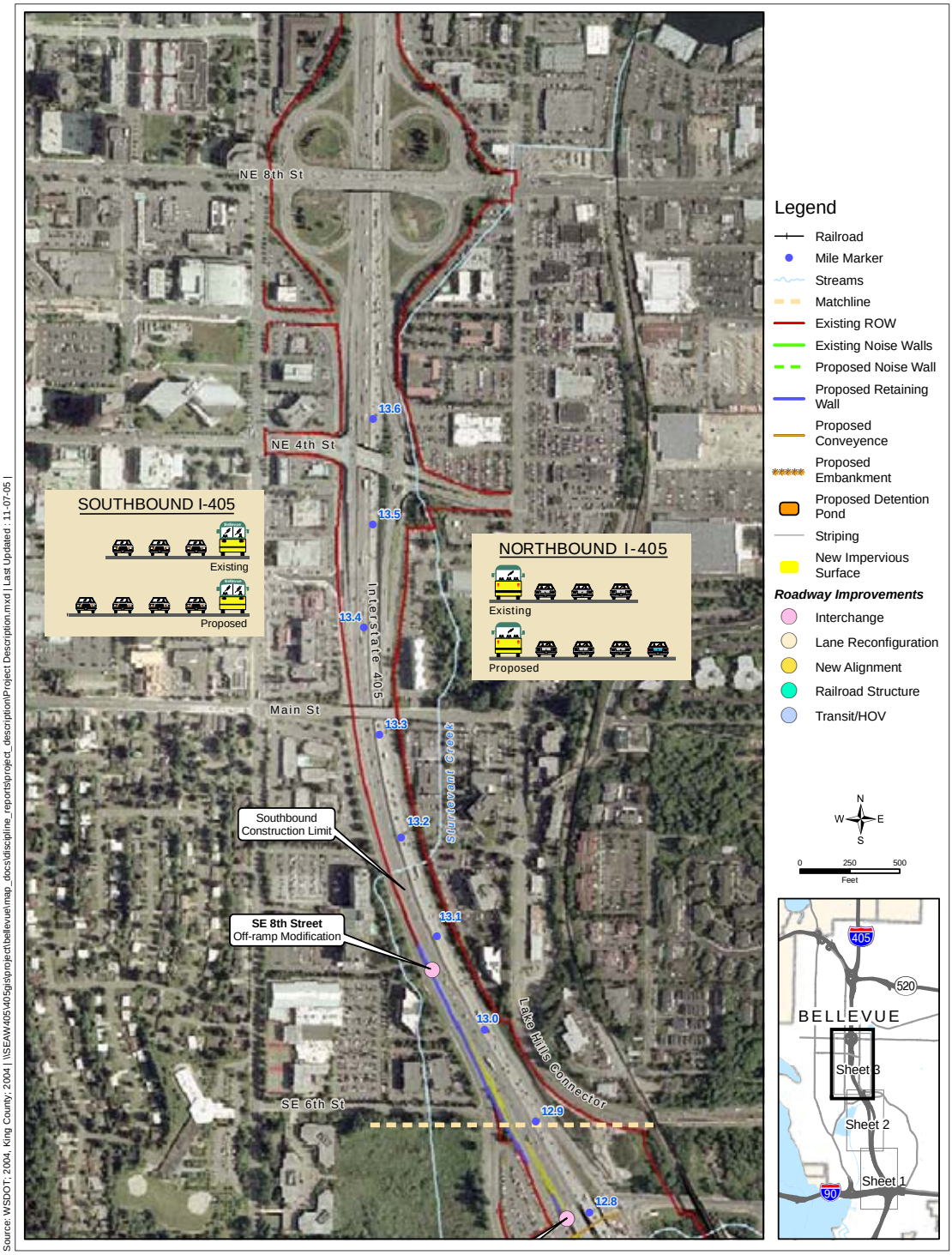
Exhibit 4. Proposed Bellevue Nickel Project Improvements (Sheet 3 of 3)



Source: WSDOT; 2004, King County; 2004 | \\SEAW405\405gis\project\bellevue\map_docs\discipline_reports\project_description\Project Description.mxd | Last Updated : 11-07-05 |

We will also include the following improvements in the Build Alternative:

- Modify the existing off-ramp at SE 8th Street to make room for an additional southbound lane on I-405. The off-ramp will then become a single-lane, optional off-ramp (i.e., the off-ramp will no longer be an "exit only" off-ramp).
- Build a retaining wall between the SB travel lanes and the off-ramp at SE 8th Street.
- Widen the existing bridge over SE 8th Street to the west to accommodate the new SB lane.
- Modify the existing on-ramp at SE 8th Street to tie into the relocated SB general-purpose travel lanes.
- Reconfigure the on-ramp at SE 8th Street to accommodate the extended outside HOV lane.
- Temporarily shift the existing BNSF railroad track from its current alignment to allow for continuous railroad operation during construction of the new tunnel.
- Construct retaining walls along the eastern edge of the relocated SB travel lanes.

Improvements to Northbound I-405

In the northbound (NB) direction, we plan to add one new travel lane from approximately I-90 to SE 8th Street (Exhibits 2, 3, and 4). We will add one new lane to the NB ramp from I-90. We will shift the NB lanes to allow all of the proposed widening to occur on the inside, or median side of the existing roadway.

We will add one lane in the northbound direction of I-405 from approximately I-90 to SE 8th Street. All widening of the northbound mainline will occur on the inside (median side) of the existing roadway.

Additional improvements include:

- Re-stripe the westbound/eastbound I-90 on-ramp to NB I-405 resulting in one lane becoming two lanes in the NB direction.
- Widen, shift, and re-stripe NB I-405 travel lanes north of I-90 to allow the westbound I-90 to NB I-405 on-ramp and the eastbound I-90 to NB I-405 on-ramp to enter I-405 without having to merge into a single lane.
- Construct several retaining walls needed for road widening in locations that allow for existing and future widening of I-405.

- Construct a noise barrier approximately 725 feet long and 16 feet high (see Exhibit 2).
- Widen the existing bridge over the BNSF Railroad to the west to accommodate the new NB lane.
- Modify the NB off-ramp to SE 8th Street to make it a single-lane "exit-only" off-ramp.
- Transition the NB travel lanes back into the existing lane configuration before crossing over SE 8th Street.

Improvements to the Stormwater Management System

Managing stormwater for the I-405 Bellevue Nickel Improvement Project involves the collection and treatment of rainfall runoff from the new project pavement consistent with the guidelines in the WSDOT Highway Runoff Manual.

Currently, we treat less than 5 percent of the existing runoff from paved surfaces in the project area before discharging it. We will improve this condition by treating 17 percent more area than the new paved surface area we create. By treating a greater area, we improve flow control and remove pollutants from a portion of the existing roadway as well as from newly constructed areas.

Reconfiguration and new construction associated with the SB lanes will mean that we need to replace much of the existing drainage system. We will continue to use open roadside ditches along the shoulders of the roadway shoulders where possible. We will use standard WSDOT catch basins and manhole structures to move the roadway runoff to a system of stormwater drain pipes. These features will transport runoff to treatment and flow-control facilities within the existing ROW.

We will construct three new stormwater ponds (detention ponds combined with stormwater treatment wetlands) as part of the project and enlarge the existing pond at SE 8th Street. Two of the new ponds will be located south of the Wilburton Tunnel between the SB lanes and the BNSF railroad ROW. We will construct the third new pond in the northwest quadrant of the I-90/I-405 interchange. The project will discharge treated stormwater following existing flow patterns to Mercer Slough or to the wetlands that surround it.

Best Management Practices (BMPs)

BMPs are generally accepted techniques that, when used alone or in combination, prevent or reduce adverse effects of a project. Examples include erosion control measures and construction management to minimize traffic disruption. Please see Appendix A for a complete list of BMPs.

WSDOT Standard Specifications

Guidelines and procedures established by WSDOT for roadway design and construction in a variety of design, engineering, and environmental manuals.

Avoidance and Minimization Measures

WSDOT will use best management practices (BMPs), WSDOT Standard Specifications, and design elements to avoid or minimize potential effects to the environment for the Bellevue

Nickel Improvement Project. Collectively, these measures to avoid or minimize potential effects to the environment are known as "avoidance measures." We describe these measures in more detail in an Appendix A. If the project has additional effects not addressed in the avoidance measures, we will address these measures through mitigation.

Wetland and Stream Mitigation Sites

We will compensate for adverse effects to wetlands and their buffers by creating just over an acre of wetland within the boundaries of Kelsey Creek Park (Exhibit 5). The site is located north of the intersection of Richards Road and the Lake Hills Connector.

Our general concept will be to create an area that will transition from forested land beside the Lake Hills Connector to wetlands within Kelsey Creek Park. We will reshape the surface area to create favorable conditions for the necessary wetland aquatic characteristics, and we will replant and enhance habitat in the area by constructing habitats and replanting adjacent roadside areas with forest-type vegetation.

Similarly, we will compensate for unavoidable effects to "Median Stream," the unnamed stream within the I-405 median. We have developed a conceptual stream mitigation plan that includes on-site habitat restoration and creation. The conceptual stream mitigation plan includes the following specific elements (See Exhibit 6):

- Connect the new Median Stream culvert under I-90 to the existing channel and wetland located west of SB I-405.
- Create approximately 500 linear feet of stream channel along the western slope of SB I-405.
- Buffer the created stream channel with approximately 16,000 square feet of native streamside vegetation.
- Enhance approximately 300 linear feet of riparian habitat west of SB I-405 by removing selected non-native invasive plant species and replacing with native streamside vegetation.

We provide more detailed information about mitigation efforts planned in conjunction with the Bellevue Nickel Improvement in the Surface Water, Water Quality, and Floodplains and Wetlands Discipline Reports.

Exhibit 5. Proposed Wetland Mitigation Area

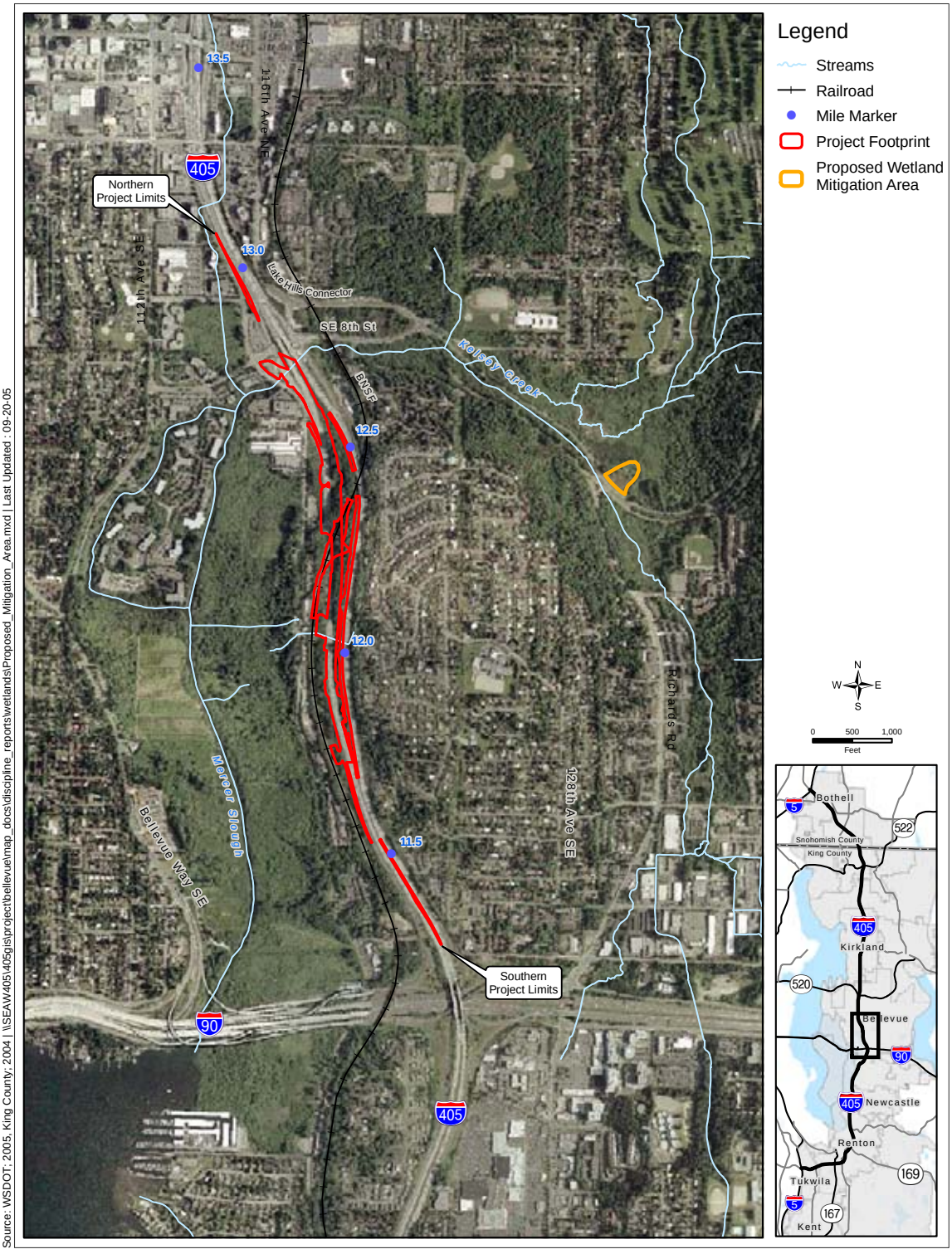
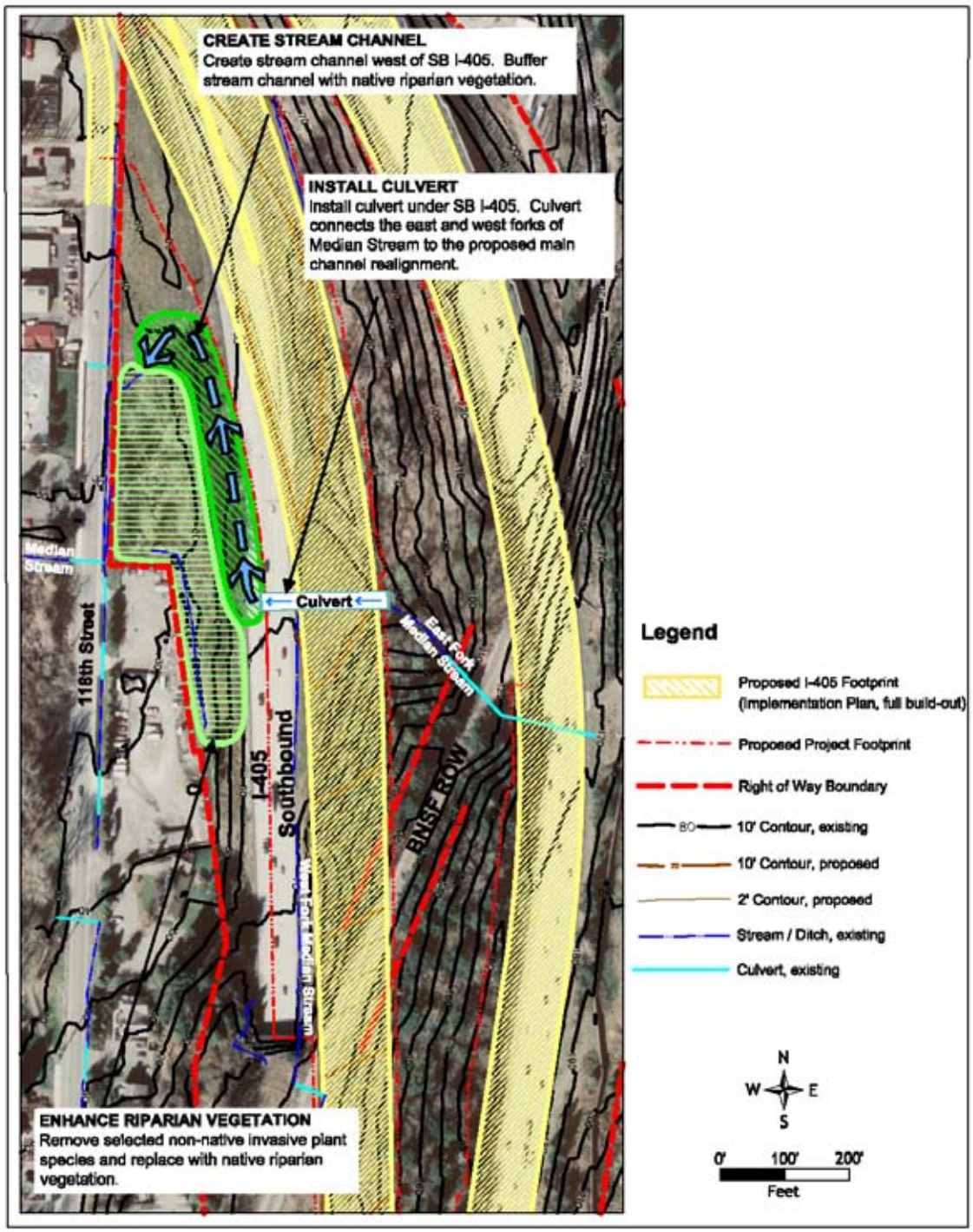


Exhibit 6. Conceptual Stream Mitigation Plan



Why do we consider energy consumption as we plan this project?

We consider energy consumption in planning this project because it is important to understand how the project will effect consumption of non-renewable resources and our future dependence on non-renewable resources. An important goal of the Washington Transportation Commission is to improve the energy efficiency of our transportation system.

WSDOT requires an evaluation of energy consumption as part of the environmental impact analyses for roadway projects. We prepared the energy analysis described in this discipline report consistent with the requirements of NEPA and following WSDOT guidance provided in the "Energy" section of the WSDOT *Environmental Procedures Manual*.

The construction of the Bellevue Nickel Improvement Project, and its long-term use by automobiles, trucks, and other forms of transportation, will consume large amounts of energy, particularly gasoline, diesel, and other fossil fuels. In this discipline report, we estimated the amount of energy that will be used during the construction period and the amount consumed by vehicles operating within the study area over the life of the project. We also estimated the effect of the No Build Alternative on long-term energy consumption within the study area, and compared the calculated value to the Build Alternative.

What are the key points of this report?

The key points of this report are as follows:

- The proposed project will reduce rush-hour traffic congestion along I-405 and will allow more cars to travel at energy-efficient travel speeds.
- Construction of the Bellevue Nickel Improvement Project will use an estimated 455,000 million British Thermal Units (MBTU) of energy during the 3-year construction period, an amount equal to the total annual energy used each year by all vehicles traveling through the Bellevue Nickel Improvement Project study area after construction is completed.
- In 2014, vehicles traveling through the completed project will use 513,000 MBTU of energy per year compared to 519,000 MBTU per year if the project is not built. Therefore, the Build Alternative will reduce annual energy usage in 2014 by roughly 1 percent.

Existing Conditions

What is the study area for this analysis and how did we determine it?

The study area for this analysis extends from I-90 to approximately SE 8th Street. It includes both the northbound and southbound lanes of I-405 within this area. This analysis estimates the amount of energy that will be consumed during construction of the project and by vehicles traveling through the study area after project completion. We provide calculation spreadsheets in Appendix B.

How did we estimate current and future fuel consumption within the Bellevue Nickel study area?

How do we describe energy usage?

There are many ways to describe the energy content of fuels and energy used by transportation systems. For this analysis, we describe energy in terms of British Thermal Units or BTU. Because transportation systems use exceptionally large amounts of energy, their energy usage is commonly described in units of million BTU or MBTU.

Congestion building along the I-405 corridor

What is a British Thermal Unit?

A BTU is a standard unit of energy used to relate many different energy sources. A BTU is defined by the amount of energy it takes to heat 1 pound of water 1 degree Fahrenheit.

A BTU is the energy required to heat 1 pound of water by 1 degree Fahrenheit. For perspective, various fuels used for transportation systems contain the following typical heat contents:

One gallon of gasoline contains 125,000 BTU or 0.125 MBTU.

One gallon of diesel fuel contains 140,000 BTU or 0.14 MBTU.

Source: Washington Community, Trade and Economic Development website at www.cted.wa.gov.

What information did we use to estimate fuel consumption?

We used the following information to calculate energy used during construction and operation (the specific methods we used are described in the next section):

- Construction costs, expressed as 2005 dollars.
- Average vehicle speed during the morning peak rush hour period and the evening peak rush hour period for existing conditions (2002) and the year 2014 for both the Build Alternative and No Build Alternative.
- Average daily trips along the northbound and southbound lanes, for existing conditions (2002) and the year 2014 for both the Build Alternative and No Build Alternative. The year 2002 was used to define the "existing conditions" because that is the most recent year for which WSDOT has actual traffic data.
- Average fuel economy for vehicles traveling at a variety of speeds (U.S. Department of Energy 2004).

How did we evaluate fuel usage?

We used two different methods to evaluate energy (fuel) usage: one to estimate short-term energy consumption for project construction; the other, to evaluate long-term energy savings provided by reducing traffic congestion along the improved sections of I-405.

We determined the amount of energy consumed during construction using guidelines developed by the California Department of Transportation (Caltrans 1983). For any given type of roadway construction project, the energy required to build the project is roughly proportional to the construction cost. Caltrans recommends using 8,430 BTU per dollar of construction cost for freeway-widening projects (adjusted to a Year 2005 cost basis). This energy consumption factor includes energy used to manufacture the building materials, fuel to transport the materials to the project site, and energy to power onsite construction equipment.

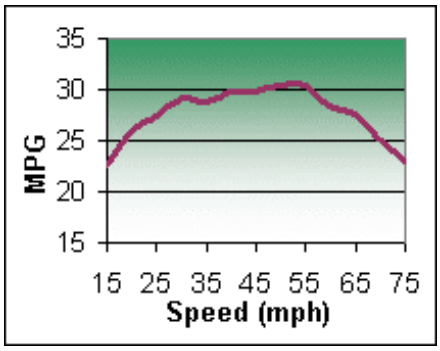
Traffic congestion (excessive idling and stop-and-go driving) substantially reduces fuel economy compared to free-flow conditions. Exhibit 7 shows average fuel consumption (in miles per gallon [mpg]) for vehicles traveling at speeds between 15 and 75 miles per hour (mph). As shown in Exhibit 7, fuel economy is best when vehicles travel between 45 and 55 mph.

The project is expected to improve traffic flow and allow vehicles to travel through the study area at a higher average speed.

Current heavy traffic volumes on I-405 force vehicles to travel at inefficient speeds during many hours of the day. Improving traffic flow by adding new lanes within the study area will allow more cars to travel at these more efficient speeds.

We estimated energy consumption during operation of the project based on forecasted vehicle speeds and the estimated fuel economy data shown in Exhibit 7.

Exhibit 7.
Average Automobile Fuel Economy vs. Vehicle Speed



Source: U.S. Department of Energy and U.S. Environmental Protection Agency (2004)

We calculated annual energy usage for both the Build and No Build Alternatives for 2002 and 2014. We used 2002 as the year for existing conditions because that is the most recent year for which WSDOT has actual traffic data.

Our traffic modelers provided the forecast Average Daily Traffic (ADT), the annual vehicle miles traveled (VMT per year) and the forecast vehicle speed through the corridor during the morning rush-hour period and the evening rush-hour period for both 2002 and 2014. We assumed that on a typical day, 25 percent of the vehicles pass through the study area during the morning peak period (at a congested speed), 25 percent pass through during the evening peak period (at a congested speed), and 50 percent pass through at other times of the day traveling at the posted speed limit.

According to the Traffic and Transportation Discipline Report, more vehicles will travel along I-405 under the Build Alternative compared to the No Build Alternative. For the No Build Alternative, we included those additional vehicles, but assumed that they would drive to their destination along local surface streets rather than on I-405. We also assumed the drivers traveling along local surface streets under the No Build Alternative would do so at an average speed of 25 mph.

We used the fuel economy data in Exhibit 7 to estimate the average fuel economy (expressed as miles per gallon) for each condition's average speed. We then calculated the annual gallons of fuel used for each condition using the following equation:

$$\text{Annual Fuel Usage (gallons/year)} = \frac{\text{Annual vehicle miles traveled (miles/year)}}{\text{Fuel economy (miles/gallon)}}$$

Finally, we calculated the annual energy usage (in MBTU per year) by multiplying the number of gallons of fuel used per year times the typical energy content for gasoline (0.125 MBTU per gallon).

What is the current fuel usage within the study area?

The I-405 corridor is heavily used and frequently congested with traffic because it is one of only two major north-south freeways serving commuters and regional travelers. The congestion level indicates that the available roadway capacity is fully used and traffic is being forced to operate at lower speeds and with limited maneuverability.

For this energy analysis, traffic volumes are expressed as the ADT on all combined traffic lanes during a 24-hour period. The total travel distance along the I-405 corridor is expressed as VMT.

We estimated that in 2002, vehicles traveling through the study area collectively traveled an estimated 115 million miles. Due to traffic congestion, the speed of vehicles driving along I-405 is currently only about 15–30 mph during peak morning and peak evening periods, compared to about 60 mph during nighttime free-flow conditions. The average vehicle speed along the corridor (averaged over the entire day) is 50 mph. Vehicles traveling at 50 mph have an average fuel efficiency of 30.8 mpg. Note that, as shown in Exhibit 7, the existing average daily speed of 50 mph is nearly the most energy-efficient travel speed. Vehicles traveling through the study area currently use 3,737,000 gallons of gasoline each year, equivalent to 467,000 MBTU per year of energy usage. This amount of energy usage is equivalent to the annual energy usage of 5,100 homes.

Electric utility lines criscross the study area

Potential Effects

How much energy would the Bellevue Nickel Improvement Project use for construction?

Energy consumption during construction is proportional to the project's size, and is estimated at about 8,430 BTUs per dollar of construction cost (expressed as 2005 dollars). The estimated construction cost for the Bellevue Nickel Improvement Project is roughly $54 million in Year 2005 dollars, excluding costs for right of way acquisition. We used the Cost Estimating Validation Process (CEVP) to obtain the construction cost in order to estimate energy consumption. Using the Caltrans construction energy factor, we calculated that construction activity will require an estimated 455,000 MBTU of energy over the entire construction period (that is equivalent to 3.6 million gallons of diesel fuel). This rate accounts for energy consumed in the manufacture of materials, fuel to transport those materials to the job site, and fuel to operate the onsite machinery and equipment during construction.

As described in the next section, the total energy that will be used to construct the project over a 3-year period is roughly equal to the energy that will later be consumed each year by vehicles passing through the study area after construction is complete.

Typical highway construction scene

How would an improved transportation system benefit energy use in the study area?

The proposed project will slightly reduce energy use compared to the No Build Alternative. Traffic volumes are forecast to increase in the study area in the future whether the project is built or not. The traffic model predicts that more vehicles will use I-405 with the Build Alternative than if the project is not built. Even though the number of vehicles traveling through the study area will increase, energy use will be slightly less because vehicles will be traveling at more energy efficient speeds.

In 2014, with the Build Alternative, we expect an average of 225,000 vehicles per day to travel through the study area traveling at a daily-average speed of 46 mph and using 4,102,000 gallons of gasoline per year (equivalent to 513,000 MBTU per year of energy).

The estimated energy consumption in this report is based on 2004 fuel economy data. Fuel consumption rates per VMT are likely to decrease over time because vehicle fuel efficiency will improve with the increasing use of hybrid cars and other new technologies. If the future trend to more efficient vehicles continues, then the actual fuel consumption in 2014 may be less than described in this analysis.

How would the No Build Alternative affect energy use in the study area?

The No Build Alternative would use slightly more fuel than the Build Alternative. WSDOT forecasts that under the No Build Alternative, some motorists would choose to avoid congestion on I-405 by traveling on surface streets. Those vehicles would drive at lower speeds and would experience slightly lower fuel economy than vehicles driving on the freeway. Furthermore, vehicles traveling on the freeway would experience slightly more congested conditions compared to the Build Alternative.

In 2014, with the No Build Alternative, 225,000 vehicles per day would travel through the study area—218,000 vehicles on I-405 and 7,000 vehicles on surface streets. Vehicles on I-405 would travel at a daily-average speed of 45 mph, while vehicles on surface streets would travel at 25 mph. The combined vehicles would use 4,149,000 gallons of gasoline per year (equivalent to 513,000 MBTU per year of energy). The annual energy usage under the No Build Alternative would be slightly higher (approximately 1 percent) than the Build Alternative.

Does the project have other effects that could be delayed or distant from the project?

Indirect effects are defined as "effects caused by the proposed action that are later in time or farther removed in distance but still reasonably foreseeable."

Other than the direct effects during construction and operation described previously, the Bellevue Nickel Improvement Project would have little effect on vehicle travel outside the immediate study area. Therefore, we conclude that neither the Build nor the No Build Alternative would cause any indirect effects on energy usage.

Did we consider potential cumulative effects for the Build and No Build Alternatives?

Per FHWA guidance, cumulative effects analysis is discipline-specific and generally performed for the disciplines directly affected by the action (such as a transportation project) under study. However, not all of the disciplines directly affected by a project will require a cumulative effects analysis. The disciplines subject to cumulative effects analysis should be determined on a case-by-case basis early in the NEPA process, generally as part of early coordination or scoping. Consistent with the *I-405 Corridor Program Final EIS* and the results of scoping for the Bellevue Nickel Improvement Project, WSDOT did not analyze cumulative effects for this discipline. The Build Alternative will reduce annual energy usage in 2014 by roughly 1 percent.

Vehicles traveling through the study area each year consume enough energy to suppy 5,100 homes with electricity.

Measures to Avoid or Minimize Project Effects

How will we avoid or minimize adverse effects from construction?

WSDOT will develop specifications for project construction to encourage energy conservation. We will adhere to construction practices that promote efficient energy use, such as limiting idling equipment, encouraging construction workers to carpool, and locating staging areas near work sites.

How will we avoid or minimize adverse effects from an improved transportation system?

Because there are no adverse effects, no measure to minimize or avoid adverse effects are proposed or necessary. After construction is complete, the proposed action will improve traffic flow along I-405 and slightly improve daily average vehicle speed and average fuel economy within the study area.

The Bellevue skyline from NB I-405

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Appendix A

Avoidance and Minimization Measures

Avoidance and Minimization Measures

The following sections describe the established design and construction practices that WSDOT will include to avoid or minimize effects to the various environmental resources during both the construction and operation phases of the project.

Project Measures to Avoid or Minimize Effects During Construction

Design elements, such as modifications to boundaries of areas that can be affected, have been incorporated into the project specifications, construction plans, and procedures, to help avoid or minimize most potential construction impacts. When appropriate, monitoring will be conducted to ensure that these design and construction measures are effective.

Measures for Geology, Soils, and Groundwater

- WSDOT will prepare and implement a Temporary Erosion and Sedimentation Control (TESC) plan consisting of operational and structural measures to control the transport of sediment. Operational measures include removing mud and dirt from trucks before they leave the site, covering fill stockpiles or disturbed areas, and avoiding unnecessary vegetation clearing. Structural measures are temporary features used to reduce the transport of sediment, such as silt fences and sediment traps.
- WSDOT will reduce degradation of moisture-sensitive soils by limiting major earthwork to the drier, late spring through early fall construction season; by maintaining proper surface drainage to avoid ponding of surface water or groundwater; by minimizing ground disturbance through limiting the use of heavy equipment, limiting turns, and/or not tracking directly on the subgrade; and by covering the final subgrade elevation with a working mat of crushed rock and/or geotextile for protection. Mixing a soil admix such as cement into the subgrade may also add strength and stabilize the ground.
- WSDOT will determine acceptable limits for off-site construction-related ground vibration before construction begins and demonstrate that off-site ground vibrations are within the limits set for the project through the use of vibration-monitoring equipment.
- WSDOT will identify areas subject to shaking from a large earthquake and will mitigate risks using ground modifications or other procedures identified in the WSDOT Geotechnical Design Manual.
- WSDOT will implement construction procedures identified in the geotechnical investigation to maintain or enhance slope stability in areas potentially underlain by landslide-prone soils.
- WSDOT will protect the Kelsey Creek aquifer from contamination by construction-related spills by development and implementation of BMPs and a Spill Prevention Control and

Countermeasures plan (SPCCP). The SPCC will specifically address fuel spills from vehicles and from spills of other chemicals commonly transported over I-405. Spill response equipment will be located at regular and specified intervals within the project area for minimizing countermeasure response times.

- WSDOT will ensure only clean fill is imported and placed for the project and will require documentation for fill brought onto the site from the supplier certifying that the fill does not exceed Washington State soil cleanup standards. If documentation is not available, testing of imported fill soils will be required prior to placement. Suspect soils encountered during project construction will be tested and, where necessary, removed from the site and disposed of in accordance with Washington State regulations.
- WSDOT will identify and develop staging areas for equipment repair and maintenance away from all drainage courses. Washout from concrete trucks will not be dumped into storm drains or onto soil or pavement that carries stormwater runoff. A wash down area for equipment and concrete trucks will be designated and the use of thinners and solvents to wash oil, grease, or similar substances from heavy machinery or machine parts will be prohibited.
- WSDOT will obtain a NPDES (National Pollutant Discharge Elimination System) permit and will conduct a regular program of testing and lab work to ensure that water encountered during construction meets the water quality standards specified in the NPDES permit.
- WSDOT will to meet the NPDES water quality standards prior to the discharge of the encountered water to a surface water body, such as Kelsey Creek. If necessary, water quality will be improved, such as by using sediment ponds to allow sediment to settle out prior to discharge.
- If it is necessary to install seepage drains to control seepage for retaining walls and fill embankments, WSDOT will include special provisions in the design to discharge drain flow back into affected areas, including wetlands.

Measures for Water Quality

In addition to measures for geology, soils, groundwater, and for hazardous materials that are protective of water quality, the following measures would be implemented for water quality.

- WSDOT will identify and develop staging areas for equipment repair and maintenance away from all drainage courses.
- Washout from concrete trucks will not be dumped into storm drains or onto soil or pavement that carries stormwater runoff.
- Thinners and solvents will not be used to wash oil, grease, or similar substances from heavy machinery or machine parts.
- WSDOT will designate a wash down area for equipment and concrete trucks.

Measures for Wetlands

- WSDOT will protect, preserve, and enhance wetlands in the project area during the planning, construction, and operation of transportation facilities and projects consistent with USDOT Order 5660.1A, Executive Order 11990, and Governor's Executive Orders EO 89-10 and EO 90-04.
- WSDOT's project-level design and environmental review has included avoidance, minimization, restoration, and compensation of wetlands. WSDOT will implement these measures prior to or concurrent with adverse effects on wetlands, to reduce temporal losses of wetland functions.
- WSDOT will follow guidance contained in the wetlands section of the WSDOT Environmental Procedures Manual (WSDOT 2004a), which outlines the issues and actions to be addressed prior to authorizing work that could affect wetlands.
- WSDOT will use high-visibility fencing to clearly mark wetlands to be avoided in the construction area.

Measures for Upland Vegetation and Wildlife

- WSDOT will ensure mitigation measures established in the I-405 Corridor EIS will be implemented on the Bellevue Nickel Improvement Project.
- WSDOT will prepare and implement a revegetation plan. In addition, areas with mixed forest will not be removed for temporary use (i.e., construction staging). If an area of mixed forest must be removed for roadway construction, it will be replaced with plantings of native tree and shrub species within the affected area.
- WSDOT will adhere to project conditions identified in the Biological Assessment and agency concurrence letters.
- WSDOT will limit construction activity to a relatively small area immediately adjacent to the existing roadway to minimize vegetation clearing and leave as many trees as possible.

Measures for Fisheries and Aquatic Resources

- WSDOT will implement construction BMPs (such as silt fencing or sedimentation ponds) to avoid disturbing sensitive areas during the development and use of any staging areas, access roads, and turnouts associated with resurfacing activities.
- WSDOT will not allow in-water work to occur except during seasonal work windows established to protect fish.
- WSDOT will require that all stormwater treatment wetland/detention facilities are sited and constructed at a sufficient distance from named and unnamed streams so no grading or filling in the streams or the streamside zones will be required.

Measures for Air Quality

- WSDOT will require preparation and implementation of a Fugitive Dust Control Plan in accordance with the Memorandum of Agreement between WSDOT and PSCAA Regarding Control of Fugitive Dust from Construction Projects (October 1999).
- During dry weather, exposed soil will be sprayed with water to reduce emissions of and deposition of particulate matter (PM_{10}).
- WSDOT will provide aequate freeboard (space from the top of the material to the top of the truck), cover truckloads, and, in dry weather, wet materials in trucks to reduce emission of and deposition of particulate matter during transport.
- WSDOT use wheel washers to remove particulate matter that would otherwise be carried offsite by vehicles to decrease deposition of particulate matter on area roadways.
- WSDOT will remove particulate matter deposited on public roads to reduce mud on area roadways.
- WSDOT will cover or spray with water any dirt, gravel, and debris piles during periods of high wind when the stockpiles are not in use to control dust and transmissions of particulate matter.
- WSDOT will route and schedule construction trucks to reduce travel delays and unnecessary fuel consumption during peak travel times, and therefore reduce secondary air quality impacts (i.e. emissions of carbon monoxide and nitrogen oxides) that result when vehicles slow down to wait for construction trucks.

Measures for Noise

- Noise berms and barriers will be erected prior to other construction activities to provide noise shielding.
- The noisiest construction activities, such as pile driving, will be limited to between 7 AM and 10 PM to reduce construction noise levels during sensitive nighttime hours.
- Construction equipment engines will be equipped with adequate mufflers, intake silencers, and engine enclosures.
- Construction equipment will be turned off during prolonged periods of nonuse to eliminate noise.
- All equipment will be maintained appropriately and equipment operators will be trained in good practices to reduce noise levels.
- Stationary equipment will be stored away from receiving properties to decrease noise.
- Temporary noise barriers or curtains will be constructed around stationary equipment that must be located close to residences.
- Resilient bed liners will be required in dump trucks to be loaded on site during nighttime hours.

- WSDOT use Occupational Safety and Health Administration (OSHA)-approved ambient sound-sensing backup alarms that would reduce disturbances during quieter periods.

Measures for Hazardous Materials

Known or Suspected Contamination within the Build Alternative Right of Way

- WSDOT will prepare an SPCCP that provides specific guidance for managing contaminated media that may be encountered within the right of way (ROW).
- WSDOT may be responsible for remediation and monitoring of any contaminated properties acquired for this project. WSDOT will further evaluate the identified properties before acquisition or construction occurs. Contamination in soils will be evaluated relative to the Model Toxics Control Act (MTCA).
- If WSDOT encounters an underground storage tank (UST) within the ROW, WSDOT will assume cleanup liability for the appropriate decommissioning and removal of USTs. If this occurs, WSDOT will follow all applicable rules and regulations associated with UST removal activities.
- WSDOT will conduct thorough asbestos-containing material/lead paint building surveys by an Asbestos Hazard Emergency Response Act (AHERA)-certified inspector on all property structures acquired or demolished. WSDOT will properly remove and dispose of all asbestos-containing material/lead-based paint in accordance with applicable rules and regulations.
- Construction waste material such as concrete or other harmful materials will be disposed of at approved sites in accordance with Sections 2-01, 2-02, and 2-03 of the WSDOT Standard Specifications.
- WSDOT may acquire the responsibility for cleanup of any soil or groundwater contamination encountered during construction (that must be removed from the project limits) within WSDOT ROW. Contamination will be evaluated relative to Model Toxics Control Act (MTCA) cleanup levels.
- WSDOT will consider entering into pre-purchaser agreements for purpose of indemnifying itself against acquiring the responsibility for any long-term cleanup and monitoring costs.
- All regulatory conditions imposed at contaminated properties (e.g., Consent Decree) associated with construction will be met. These conditions could include ensuring that the surrounding properties and population are not exposed to the contaminants on the site: i.e., WSDOT will ensure that the site is properly contained during construction so that contaminants do not migrate offsite, thereby protecting the health and safety of all on-site personnel during work at the site.

Known or Suspected Contamination Outside of the Right of Way

- Contaminated groundwater originating from properties located up-gradient of the ROW could migrate to the project area. WSDOT generally will not incur liability for groundwater contamination that has migrated into the project footprint as long as the agency does not

acquire the source of the contamination. However, WSDOT will manage the contaminated media in accordance with all applicable rules and regulations.

Unknown Contamination

- If unknown contamination is discovered during construction, WSDOT will follow the SPCCP as well as all appropriate regulations.

Worker and Public Health and Safety and other Regulatory Requirements

The WSDOT will comply with the following regulations and agreements:

- State Dangerous Waste Regulations (Chapter 173-303 WAC);
- Safety Standards for Construction Work (Chapter 296-155 WAC);
- National Emission Standards for Hazardous Air Pollutants (CFR, Title 40, Volume 5, Parts 61 to 71);
- General Occupational Health Standards (Chapter 296-62 WAC); and
- Implementing Agreement between Ecology and WSDOT Concerning Hazardous Waste Management (April 1993).

Hazardous Materials Spills During Construction

- WSDOT will prepare and implement a SPCCP to minimize or avoid effects on human health, soil, surface water and groundwater.

Measures for Traffic and Transportation

- WSDOT will coordinate with local agencies and other projects to prepare and implement a Traffic Management Plan (TMP) prior to making any changes to the traffic flow or lane closures. WSDOT willl inform the public, school districts, emergency service providers, and transit agencies of the changes ahead of time through a public information process. Pedestrian and bicycle circulation will be maintained as much as possible during construction.
- Prior to and during construction, WSDOT will implement strategies to manage the demand on transportation infrastructure. These transportation demand management strategies will form an important part of the construction management program and will be aimed at increasing public awareness and participation in HOV travel. The major focus will be on expanding vanpooling and van-share opportunities. Other elements of the transportation demand management plan may include:
    - increased HOV awareness and public information, and
    - work-based support and incentives.

Measures for Visual Quality

- WSDOT will follow the I-405 Urban Design Criteria. Where the local terrain and placement of light poles allow, the WSDOT will reduce light and glare effects by shielding roadway lighting and using downcast lighting so light sources will not be directly visible from residential areas and local streets.
- WSDOT will restore (revegetate) construction areas in phases rather than waiting for the entire project to be completed.

Measures for Neighborhoods, Businesses, Public Services and Utilities

- WSDOT will prepare and implement a transportation management plan (TMP). If local streets must be temporarily closed during construction, WSDOT will provide detour routes clearly marked with signs.
- WSDOT will coordinate with school districts before construction.
- WSDOT will implement and coordinate the TMP with all emergency services prior to any construction activity.
- WSDOT will coordinate with utility providers prior to construction to identify conflicts and resolve the conflicts prior to or during construction. Potential utility conflicts within WSDOT ROW will be relocated at the utility's expense prior to contract award.
- WSDOT will prepare a consolidated utility plan consisting of key elements such as existing locations, potential temporary locations and potential new locations for utilities; sequence and coordinated schedules for utility work; and detailed descriptions of any service disruptions. This plan will be reviewed by and discussed with affected utility providers prior to the start of construction.
- WSDOT will field verify the exact locations and depths of underground utilities prior to construction.
- WSDOT will notify neighborhoods of utility interruptions by providing a scheduled of construction activities in those areas.
- WSDOT will coordinate with utility franchise holders and provide them with project schedules to minimize the effects of utility relocations (for example, equipment procurement times, relocation ahead of construction, etc.)
- WSDOT will notify and coordinate with fire departments for water line relocations that may affect water supply for fire suppression, and establish alternative supply lines prior to any breaks in service; and to ensure that fire departments can handle all calls during construction periods and to alleviate the potential for increased response times.
- WSDOT will notify and coordinate with police departments to implement crime prevention principles and to ensure that they have adequate staffing to provide traffic and pedestrian control.

- WSDOT will maintain access to businesses throughout the construction period through careful planning of construction activities and an awareness of the needs to provide adjacent properties with reasonable access during business hours. As part of construction management, WSDOT will prepare access measures. WSDOTT will make provisions for posting appropriate signs to communicate the necessary information to potential customers.
- WSDOT will keep daytime street closures to a minimum to provide access for businesses during regular business hours.

Measures for Cultural Resources

- WSDOT will prepare an Unanticipated Discovery Plan for the project that WSDOT will follow. This will avoid or minimize unanticipated effects to historic, cultural, and archaeological resources.

Project Measures to Avoid or Minimize Effects During Project Operation

The following sections describe the measures that WSDOT will implement during project operation.

Measures for Surface Waters and Water Quality

- WSDOT will follow the Highway Runoff Manual for both the design and implementation of stormwater facilities. WSDOT is not required to manage flow where drainage is directly to Mercer Slough. Where drainage is to a tributary to Mercer Slough, WSDOT will construct a stormwater management system that does provide flow control.

Measures for Fisheries and Aquatic Resources

- WSDOT will compensate for adverse effects to fish habitat and aquatic resources by providing in-kind mitigation. This in-kind mitigation will take the form of on-site, off-site, or a combination of on- and off-site mitigation.
- Off-site mitigation could include planting native riparian vegetation outside of the study area in areas where restoring native riparian buffers may have a greater benefit to fish and aquatic species. Mitigation could be concentrated along streams with high fish use where important stream processes and functions related to riparian buffers (for example, large woody debris [LWD] recruitment levels, litter fall, and bank stabilization) are impaired.
- On-site/off-site mitigation could include installing in-stream habitat features (for example, boulders or LWD) in the streambed downstream of the project footprint to increase the habitat complexity of the affected waterbody.

- Ongoing maintenance (during and post-construction) of stormwater treatment and detention facilities by WSDOT will not include the application of any chemical weed control agents (e.g., herbicides).

Measures for Upland Vegetation and Wildlife

- WSDOT will replace areas of mixed forest that will be permanently removed for roadway construction with plantings of native tree and shrub species within the affected area.

Appendix B

Energy Calculation Spreadsheets

Table 1. Existing and Future Energy Usage Along the Bellevue Nickel I-405 Corridor

Alternative	Average Daily Traffic Volume (vehicles per day)	Annual VMT (millions)	24-Hour Average Speed (mph)	Average Fuel Economy (mpg)	Gasoline Usage (Gallons/Year)	Energy Usage (MBTU/year)
Existing Conditions (2002)	210,000	114,878,100	50.4	30.8	3,737,654	467,207

Exhibit E-2. Existing and Future Energy Usage Along the Bellevue Nickel I-405 Corridor

Roadway Segment	**Average Daily Traffic Volume (vehicles per day)**	**Annual VMT (millions)**	**Daily Average Speed (mph)**	**Average Fuel Economy (mpg)**	**Gasoline Usage (Gallons/Year)**	**Energy Usage (MBTU/year)**
Existing (Year 2002)						
I-405 Freeway Traffic	210,000	114,878,100	50	30.8	3,737,654	467,207
Year 2014 With Nickel Project						
I-405 Freeway Traffic	225,000	123,058,050	46	30.0	4,101,935	512,742
Surface Streets	0	0	25	27.5	0	0
Combined Total	225,000	123,058,050	--	--	4,101,935	512,742
Year 2014 No-Build Alternative						
I-405 Freeway Traffic	218,000	119,252,700	45	29.8	4,010,467	501,308
Surface Streets	7,000	3,810,870	25	27.5	138,577	17,322
Combined Total	225,000	123,063,570	--	--	4,149,044	518,631

Reduction	1.1%

I-405 Average Travel Speeds - General Purpose Lanes

AM Peak Hour

Location	I-405 Northbound		
	2002	2014 NA	2014 NI
I-90 to SE 8th Street	30-45 mph	25-40 mph	30-45 mph

Location	I-405 Southbound		
	2002	2014 NA	2014 NI
SE 8th Street to I-90	45-60 mph	35-50 mph	45-60 mph

PM Peak Hour

Location	I-405 Northbound		
	2002	2014 NA	2014 NI
I-90 to SE 8th Street	45-60 mph	25-40 mph	20-35 mph

Location	I-405 Southbound		
	2002	2014 NA	2014 NI
SE 8th Street to I-90	15-30 mph	5-20 mph	5-20 mph

NA = No Action
NI = Nickel

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I-405 Average Travel Speeds - General Purpose Lanes

AM Peak Hour (25% of AADT)

Location	I-405 Northbound		
	2002	2014 NA	2014 NI
I-90 to SE 8th Street	37	32	37

Location	I-405 Southbound		
	2002	2014 NA	2014 NI
SE 8th Street to I-90	52	42	52

PM Peak Hour (25% of AADT)

Location	I-405 Northbound		
	2002	2014 NA	2014 NI
I-90 to SE 8th Street	52	32	27

Location	I-405 Southbound		
	2002	2014 NA	2014 NI
SE 8th Street to I-90	22	12	12

Non-Peak (50% of AADT)

Location	I-405 Northbound		
	2002	2014 NA	2014 NI
I-90 to SE 8th Street	60	60	60

Location	I-405 Southbound		
	2002	2014 NA	2014 NI
SE 8th Street to I-90	60	60	60

Daily Composite Speed

Location	I-405 Northbound		
	2002	2014 NA	2014 NI
I-90 to SE 8th Street	52	46	46

Location	I-405 Southbound		
	2002	2014 NA	2014 NI
SE 8th Street to I-90	49	44	46

NA = No Action
NI = Nickel

I-405 Average Fuel Usage

Location	Average Composite Speed		
	2002	2014 NA	2014 NI
Northbound I-90 to SE 8th Speed (mph)	52	46	46
NB Fuel Mileage (mpg)	31.0	30.0	30.0
Southbound SE 8th to I-90 Speed (mph)	49	44	46
SB Fuel Mileage (mpg)	30.5	29.5	30.0
Average NB + SB Speed (mph)	50	45	46
Combined NB + SB Fuel Mileage (mpg)	30.75	29.75	30.00
On-Street Speed (mph)	25	25	25
On-Street Mileage (mpg)	27.50	27.50	27.50

Location	ADT		
	2002 Actual Counts	2014 NA	2014 NI
Northbound I-90 to SE 8th Street	104,000	108,000	112,000
Southbound SE 8th Street to I-90	106,000	110,000	113,000
Northbound Segment miles	1.52	1.52	1.52
Southbound Segment miles	1.65	1.65	1.65
Surface Street ADT	0	7,000	0
Surface Street Distance	1.60	1.58	1.60

Location	Annual VMT for Segment		
	2002 Actual Counts	2014 NA	2014 NI
Northbound I-90 to SE 8th Street	54,537,600	56,635,200	58,732,800
Southbound SE 8th Street to I-90	60,340,500	62,617,500	64,325,250
Freeway Combined NB + SB	114,878,100	119,252,700	123,058,050
Surface Streets	0	3,810,870	0

Note: Assumes annual equivalent of 345 days per year

Location	Annual Gallons of Gasoline		
	2002 Actual Counts	2014 NA	2014 NI
Northbound I-90 to SE 8th Street	1,759,277	1,887,840	1,957,760
Southbound SE 8th Street to I-90	1,978,377	2,122,627	2,144,175
Freeway Combined NB + SB	3,737,654	4,010,467	4,101,935
Surface Streets	0	138,577	0
Total	3,737,654	4,149,044	4,101,935

Location	Annual MBTU		
	2002 Actual Counts	2014 NA	2014 NI
Freeway Combined NB + SB	467,207	501,308	512,742
Surface Streets	0	17,322	0
Total	467,207	518,631	512,742

Note: 1 gallon of gasoline = 0.125 MBTUs

NA = No Action
NI = Nickel

I-405 Average Daily Traffic Forecasts

Location	I-405 Northbound				
	2002 Actual Counts	2014 NA	2014 NI	2030 NA	2030 NI
Northbound I-90 to SE 8th Street	104,000	108,000	112,000	120,000	127,000
Southbound SE 8th Street to I-90	106,000	110,000	113,000	121,000	128,000
Surface Streets	-	7,000	-		
Total	210,000	225,000	225,000		

NA = No Action
NI = Nickel

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